COMPONENTS OF RESISTANCE IN RAPESEED-MUSTARD LIMITING THE RATE OF EPIDEMIC DEVELOPMENT OF ALTERNARIA BRASSICAE

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ABSTRACT

For maximum spore germination of Alternaria brassicae, darkness or low light intensity, 25°C temperature and 90% RH for a period of 24 hrs were found as most congenial. A minimum period, 4 hrs of leaf wetness was essential for infection. Increase in period of leaf wetness increased infection points per leaflet.

The incubation and latent period were shorter in cultivars other than Tower and RC 781. The pathogen sporulated poorly on Tower and RC 781 and abundantly on others. The infection rate (r) of Tower and RC 781 was 0.05 and 0.09 respectively whereas in rest of the cultivars it was more than 0.41. Less number of stomata with small size openings were noted in Tower and RC 781 as compared to other cultivars.

Alternaria leaf blight of rapeseed-mustard caused by Alternaria brassicae (Berk). Sacc. is a common and serious disease all over India. Practically, very little information is available on the factors leading to epidemic development of the disease and host resistance. Therefore, the factors responsible for spore germination, infection, epidemic development and expression of host resistance were undertaken in the present study.

MATERIALS AND METHODS

The effect of temperature on spore germination and infection was carried out in an incubator. The light intensities were created in a growth room fitted with fluorescent tubes. The levels of relative humidity (RH) were maintained according to Buxton and Mellenby (1934). To maintain leaf wetness, spray inoculated plants raised in plastic pots were covered with polythene bags and incubated in an incubator. After every

4 hr three pots were removed from incubator, their leaves dried with blotting papers and taken to green house benches for observation till the appearance of symptoms.

The infection rate (r), incubation period (IP) and latent period (LP) were determined according to Van der Plank (1963). For assessing spore production, lesions of uniform size obtained from different cultivars were washed, dried and incubated in moist petriplates for 24 hrs at 25°C. Sporulation was measured with the help of a haemocytometer.

RESULTS

It is evident from Fig. 1 that spore germination was maximum (87%) at 25°C temperature after 24 hrs of incubation. More than 50% spores germinated after 16 hrs of incubation at 25°C. Spore germination was significantly reduced when temperature regimes were reduced or increased from 25°C. After 24 hrs of leaf wetness at 25°C, maximum infection points, 7.4 lesions/leaflet with average size of 15.2 mm were recorded. Infection took place even if 4 hrs of leaf wetness was provided to the plants but disease intensity increased with the increase in duration of leaf wetness. The percent spore germination was highest under darkness (Fig. 1). With the increase in light intensity from 0 lux (darkness) to 5000 lux there was a decrease in percent spore germination. Above 2000 lux of light intensity even less than 55% spores could germinate. The plants kept under darkness for 24 hrs after inoculation produced maximum number of lesions (7.0) per leaflet with maximum size of 19.40 mm. The exposure of plants to light after inoculation had adverse affects on infection and disease development. The increased light intensity from 1000 lux through 2000 lux to 5000 lux drastically inhibited the development of disease resulting in decreased number and size of lesions/ leaflet. At the optimum temperature (25°C) for A. brassicae, 90% RH gave 88% spore germination (Fig. 1) after 24 hrs of incubation. More than 80% RH was required for 24 hrs to get 80% or more spore germination. No spore germination was recorded below 30% RH.

The incubation and latent periods of A. brassicae were less in cultivars viz., Prakash, RH 30, YRT 3, CSR 741, CSR 448, and CSR 142 with the difference of 2-3 days only. However, in RC 781 and Tower higher latent period of 12 and 16 days was recorded with much wider differences of 4 and 6 days respectively between IP and LP.80 and 92 spores per lesion were produced in Tower and RC 781 whereas in Prakash, 260 spores per lesion were produced. In other cultivars spore production per lesion ranged from 120 to 240. The infection rate of different cultivars varied between 0.05 to 0.41. The highest r (0.41) was in YRT 3 and the lowest (0.05) was in Tower. The number of lesions per leaflet were less in Tower (1.8) and RC 781 (3.3) as compared to other cultivars. YRT 3 showed maximum number of 10.2 lesions per leaflet. The rate of increase in lesion size was rapid in cultivars other than Tower and RC 781. The variation in the number and size of stomata per square cm of leaf area was observed in different cultivars. Minimum number and size of stomata were observed in Tower. However, maximum number and size of stomata were found in cultivar Prakash.

DISCUSSION

The most congenial temperature for A. brassicae spore germination and infection was found to be 25°C, increase or decrease in temperature regimes led to poor germination and scanty lesion formation. The increase in percent spore germination and infection was comparatively less in the range of 15-20°C compared to 20-25°C and above. It suggested that the temperature range of 20-25°C is favourable for spore germination, infection and development of disease in epidemic form. According to Sarkar and Sen Gupta (1978) the optimum temperature for mycelial growth was 27°C and for conidial germination it was 22-32°C. For the initiation of A. brassicae infection 4 hrs of leaf wetness was required. Increase in leaf wetness period increased infection intensity. The optimum period of leaf wetness was found to be 24 hrs, where maximum disease intensity was recorded. Mukadam and Deshpande (1979) reported that the spores of A. brassicae kept under higher light intensities exhibited poor germination percentage and viability. In the present study the increase in light intensity from 0 lux to 5000 lux showed declining trend in spore germination and lesion development on the seedlings of raya (Brassica juncea). For maximum spore germination and lesion production a period of 24 hrs of incubation under darkness was found to be essential after inoculation of seedlings. It suggested that maximum infection under field conditions must be taking place during darkness. 90% RH gave the maximum spore germination after 24 hrs of incubation. It is in accordance with the observations made by Chowdhary (1937) and Sarkar and Sen Gupta (1978).

After analysis of components of resistance viz., production of Alternaria lesions/leaflet, size of lesions, infection rate, incubation period, latent period and spore production capability in eight cultivars of rapeseed-mustard, large amount of variation was observed among the cultivars. The parameters taken into account in the present study revealed that Tower and RC 781 has high order of horizontal resistance (HR) in comparison to other cultivars.

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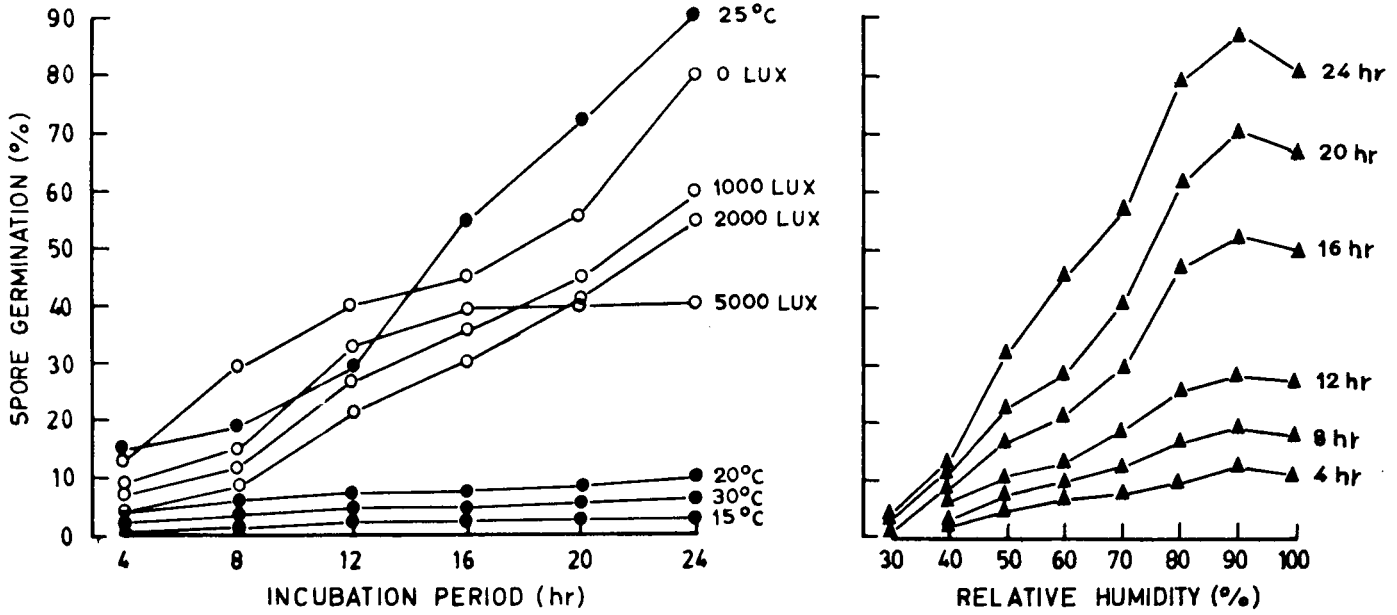

Fig.1.EFFECT OF TEMPERATURE (●), LIGHT (o) & RELATIVE HUMIDITY (▲) ON A. BRASSICAE SPORE GERMINATION.